

## A NEW CRAYFISH FROM THE OUACHITA RIVER BASIN IN ARKANSAS (DECAPODA: CAMBARIDAE)

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*Abstract.*—*Procambarus* (*Girardiella*) *reimeri* is described and illustrated from specimens collected in the Ouachita River basin in Polk County, Arkansas. Its affinities to *P. (G.) gracilis*, *P. (G.) liberorum*, and to members of the subgenus *Austrocambarus* are discussed.

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During April 1973, Jean E. Pugh, Georgia B. Hobbs, and I spent several days in western Arkansas collecting crayfishes. As a result of heavy rains the streams were at flood stage; therefore most of our efforts were expended in collecting inhabitants of roadside ditches and burrows. Two previously undescribed members of the genus *Fallicambarus* obtained at that time were described in the same year (Hobbs, 1973). Attention to new representatives of the subgenus *Girardiella* (genus *Procambarus*), however, was deferred, for it was my intention to offer these specimens to Rollin D. Reimer who had concentrated his attention on this crayfish group. Inasmuch as some years have elapsed since his unpublished dissertation was completed and his interests have broadened to include other crayfish groups, I offer the description of this new species, the existence of which appears not to have been known to Dr. Reimer. I take pleasure in naming it in his honor.

I extend my thanks to Dr. Pugh and to my wife for their assistance in collecting the material on which this description is based and to Fenner A. Chace, Jr., Margaret A. Daniel, and C. W. Hart, Jr., colleagues at the Smithsonian Institution, for their criticisms of the manuscript.

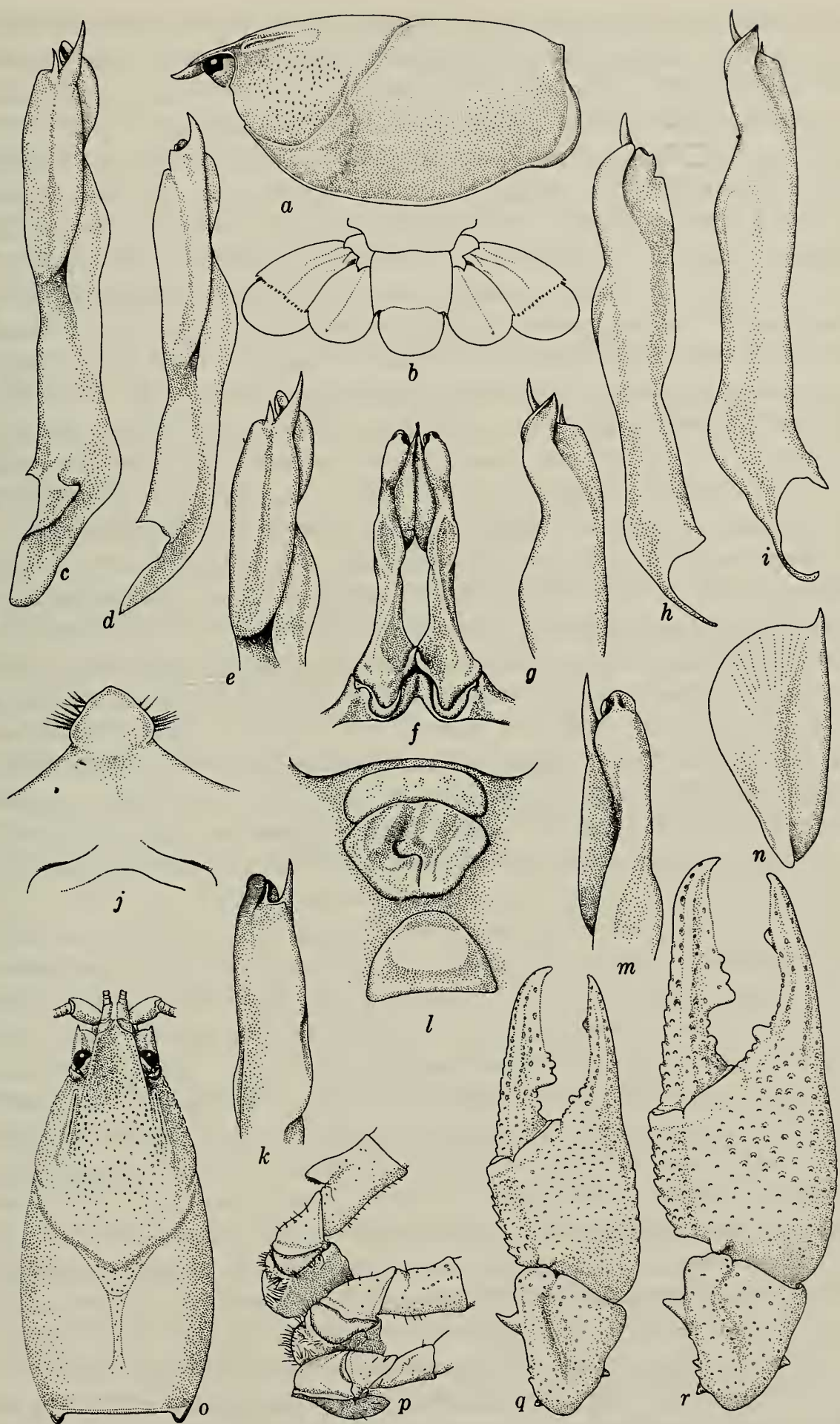
*Procambarus* (*Girardiella*) *reimeri*, new species

Fig. 1

*Diagnosis.*—Body pigmented, eyes well developed. Rostrum without marginal spines and median carina. Carapace lacking cervical spine or tu-

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Fig. 1. *Procambarus* (*G.*) *reimeri* (a-c, e-g, i-k, m-p, and r from holotype; d, h from morphotype, and l, q from allotype): a, Lateral view of carapace; b, Dorsal view of telson and uropods; c, d, e, Mesial view of first pleopod; f, Caudal view of first pleopods; g, h, i, Lateral view of first pleopod; j, Epistome; k, Cephalic view of distal part of first pleopod; l, Annulus ventralis; m, Caudal view of distal part of first pleopod; n, Antennal scale; o, Dorsal view of carapace; p, Basal podomeres of third, fourth, and fifth pereopods; q, r, Dorsal view of distal podomeres of cheliped.





bercle. Areola 16.3 to 25.3 (average 20.5) times as long as broad and constituting 34.9 to 40.2 (average 37.5) percent of total length of carapace (41.3 to 44.9, average 43.9, percent of postorbital carapace length). Suborbital angle weak but distinct. Postorbital ridge lacking cephalic spine or tubercle. Hepatic area tuberculate; branchiostegal spine vestigial or absent. Antennal scale about, or slightly more than, twice as long as wide. Ischium of third pereopod of first form male with simple hook overreaching basioischial articulation; hook not opposed by tubercle on corresponding basis; coxae of fourth and fifth pereopods lacking caudomesial boss. First pleopods of first form male reaching coxae of third pereopods, symmetrical, bearing proximomesial spur and cephalic shoulder at base of terminal elements, lacking subterminal setae but with cephalomesial row of setae along distal third to half of appendage; terminal elements (all at least partly cornified) consisting of (1) long, tapering, slightly curved mesial process extending distally beyond other terminals; (2) small, acute, slightly curved, but distally directed cephalic process at cephalic base of mesial process; (3) rather inconspicuous but composite central projection arising from between bases of cephalic, mesial, and caudal processes, and closely associated with latter; and (4) very prominent caudal process subacute and obscuring central projection in lateral aspect and somewhat rounded distally and flattened caudally in caudal aspect. Female with annulus ventralis about 1.5 times as broad as long, subsymmetrical in outline, with cephalomedian trough leading to sigmoid sinus, latter ending near median line anterior to caudal margin of annulus; ridges flanking trough devoid of tubercles; preannular (= proannular, Hobbs, 1967:9) plate well developed; postannular sclerite almost 0.9 times as long and wide as annulus, broadly elevated ventrally; first pleopod present.

*Holotypic male, form I.*—Cephalothorax (Figure 1a, o) subovate, weakly compressed laterally, although greatest width of carapace slightly more than height at caudodorsal margin of cervical groove (16.3 and 15.7 mm). Abdomen distinctly narrower than thorax (12.2 and 16.3 mm). Areola 17.9 times as long as broad; punctations sparse, only 1 or 2 across narrowest part. Cephalic section of carapace almost 1.7 times as long as areola, latter comprising 37.7 percent of total length of carapace (44.2 percent of postorbital carapace length). Surface of carapace punctate dorsally, mostly granulate laterally, granules replaced by tubercles in hepatic region. Rostrum broad basally with weakly convergent margins turning rather suddenly anteromesially over penultimate podomere of antennule and ending in slightly upturned tip above distomesial end of podomere; margins not conspicuously thickened; upper surface concave with rows of submarginal punctations, very few others in anterior third, but more abundant and larger posteriorly. Subrostral ridges weak and evident only along caudodorsal margin of orbit. Postorbital ridges moderately prominent, low but swollen caudally and

rounded cephalically, lacking tubercles or spines. Suborbital angle weak but well defined. Branchiostegal and cervical spines absent.

Abdomen shorter than carapace (30.0 and 33.2 mm). Pleura of third through fifth segments subtruncate ventrally and rounded caudoventrally. Cephalic section of telson with 2 spines in each caudolateral corner, lateral ones fixed (Fig. 1b). Cephalic lobe of epistome (Fig. 1j) broadly triangular and with irregularly arranged groups of plumose setae marginally; margins not markedly thickened and ventral surface subplane; main body of epistome lacking median fovea, only slightly depressed; epistomal zygoma broadly arched. Ventral surface of proximal podomere of antennular peduncle with spine short distance distal to midlength. Antennal peduncle lacking spines on basis and ischium; flagellum reaching tergum of second abdominal segment. Antennal scale (Fig. 1n) twice as long as broad, widest distal to midlength; greatest width of lamellar area about 2 times that of thickened lateral part.

Third maxilliped extending to level of base of ultimate podomere of antennule, ventral surface largely hidden by tufts of long plumose setae, those concealing lateral half of ventral surface of ischium borne in submarginal row and single distal cluster; part of those on mesial half long and plumose and others stiff and simple. Merus completely obscured in lateral aspect by long plumose setae extending distally from ischium and from ventrolateral surface of merus.

Right chela (Fig. 1r) subovate in cross section, not strongly depressed; palm approximately 1.4 times as broad as length of mesial margin; latter slightly greater than one-third total length of chela; almost entire palm studded with squamous to subsquamous tubercles, those situated proximolaterally smaller and more withdrawn than more mesial and distal ones. Mesial surface of palm with row of 6 tubercles flanked dorsally and ventrally by irregularly arranged ones; ventral surface with 1 tubercle on ridge flanking base of dactyl. Both fingers with low longitudinal median ridges dorsally and ventrally; ridges flanked proximally by squamous tubercles and distally by punctations. Opposable margin of fixed finger with row of 7 tubercles (third from base largest) along proximal half and very large tubercle projecting from lower level in distal part of penultimate fourth; single row of minute denticles, interrupted by tubercular row, extending from proximalmost tubercle to corneous tip of finger. Opposable margin of dactyl deeply excised proximally, with row of 5 tubercles (third from base conspicuously larger than others) along proximal two-thirds, and minute denticles arranged as on fixed finger; mesial margin with row of 8 tubercles (decreasing in size distally) along proximal two-thirds of finger.

Carpus of cheliped longer than broad with oblique furrow dorsally; mesial surface with 1 very large conical tubercle and 3 proximal to it; few tubercles on dorsomesial surface, otherwise punctate except for tubercles on disto-



ventral margin: 1 on mesiodistal condyle, and row of 5 (decreasing in size laterally) lateral to that on condyle.

Merus tuberculate along dorsodistal two-thirds of podomere; ventral surface with mesial row of 15 (left with 16) tubercles and 10 in lateral; otherwise podomere mostly punctate. Ischium with row of 4 (left with 3) tubercles ventromesially.

Hook on ischium of third pereopod (Fig. 1*p*) simple, overreaching basioischial articulation, not opposed by tubercle on corresponding basis. Coxae of neither fourth nor fifth pereopods with caudomesial boss.

Sternum between third, fourth, and fifth pereopods rather shallow but ventrolateral margins bearing conspicuous fringe of plumose setae obscuring first pleopods.

First pleopods (Fig. 1*c, e-g, i, k, m*) as described in "Diagnosis." In addition, proximomedian lobe very long.

Uropods (Fig. 1*b*) with both lobes of basal podomere bearing short acute spines; mesial ramus with distomedian spine small and situated proximal to distal margin.

*Allotypic female*.—Differing from holotype, other than in secondary sexual features, in following respects: cephalic lobe of epistome devoid of plumose setae, fovea on main body distinct; submarginal setae on ischium and merus of third maxilliped much reduced so that much of surface of lateral half of ischium exposed; opposable margin of fixed finger of chela (Fig. 1*q*) with row of 8 tubercles, that of dactyl also with 8, mesial margin of latter with row of 10; ventromesial row of tubercles on merus of cheliped consisting of 18 (17 on left) and ventrolateral row of 12; 3 tubercles forming row on basis of same appendage; sternum moderately deep but ventrolateral margins lacking conspicuous setae. (See Tab. 1.) Annulus ventralis (Fig. 1*l*) as described in "Diagnosis."

*Morphotypic male, form II*.—Differing from holotype in following respects: branchiostegal spine vestigial; cephalic lobe of epistome more broadly triangular and with fewer marginal setae; lateral row of submarginal setae on ischium of third maxilliped reduced, but appendage more hirsute than that of allotype; opposable margin of fixed finger of chela with row of 8 tubercles, that of dactyl with 6; ventromesial margin of merus of cheliped with row of 12 (13 on left), and ventrolateral row of 13 on right and 10 on left; ischium of third pereopod not nearly so well developed and not reaching basioischial articulation. (See Tab. 1.) First pleopod (Fig. 1*d, h*) with mesial process proportionately more robust than that of holotype; cephalic process reduced to short acute tubercle; central projection and caudal process not so large but more clearly defined; setae on distal half of appendage much less conspicuous.

*Color Notes (Based on topoparatypic male, form I)*.—Carapace pinkish cream, dorsolateral part of branchiostegites suffused with brown; posterior

Table 1.—Measurements (mm) of *Procambarus (G.) reimeri*.

	Holotype	Allotype	Morphotype
Carapace:			
Entire length	33.2	35.7	29.9
Postorbital length	28.3	31.0	24.9
Width	16.3	17.7	13.9
Height	15.7	17.2	13.1
Areola:			
Width	0.7	0.8	0.5
Length	12.5	13.9	10.8
Rostrum:			
Width	5.7	5.6	5.0
Length	6.3	6.1	5.9
Chela:			
Length, palm mesial margin	8.2	5.7	5.6
Palm width	11.8	8.5	8.0
Length, lateral margin	27.1	20.5	18.0
Dactyl length	17.2	13.4	11.6
Abdomen:			
Width	12.2	14.4	10.4
Length	30.0	33.3	26.0

part of mandibular adductor region, areola, and posterodorsal region pinkish brown. First abdominal tergum dark brick red, second through fifth terga cherry red, and sixth, together with all pleura, telson, and uropods, similarly colored but suffused with tan. Antennule olive mottled with pinkish tan; antennal peduncles paler and more pinkish than olive; flagella of both appendages olive tan. Cheliped pinkish cream from base to proximal half or two-thirds of merus, where becoming olive tan to brown; latter extending over carpus; chela olive mesially and dorsally, and pinkish orange ventrally and laterally, colors merging dorsolaterally. Remaining pereiopods pinkish cream proximally becoming diffused with olive and distinctly pale olive with reddish brown setae distal to midlength of merus.

*Type-locality*.—Burrows in roadside ditch about five miles northeast of Mena, Polk County, Arkansas, on unnumbered road to Irons Fork River. The comparatively simple burrows, one-half to one meter in depth, were constructed in a sandy clay soil.

*Disposition of types*.—The holotype, allotype, and morphotype are deposited in the National Museum of Natural History (Smithsonian Institution), nos. 148880, 148881, and 148882, respectively, as are the paratypes consisting of 3 ♂ I, 4 ♂ II, 10 ♀, 51 j ♂, 48 j ♀.

*Size*.—The largest specimen available is a female having a carapace length

of 41.5 (postorbital carapace length 36.0) mm. The largest and smallest first form males have corresponding lengths of 39.4 (33.9) mm and 31.6 (26.6) mm. Females carrying eggs or young have not been collected.

*Range and specimens examined.*—All of the known localities are in the Ouachita River basin of Polk County, Arkansas. The limited series available was collected by Georgia B. Hobbs, Jean E. Pugh, and H.H.H., Jr. Type-locality, 2 ♂ I, 1 ♂ II, 2 ♀, 1 j ♂, 18 Apr 1973; roadside ditch about 7 mi NE of Mena on unnumbered road to Irons Fork River, 4 j ♂, 1 j ♀, 18 Apr 1973; roadside ditch adjacent to Ouachita River, 3.4 mi E of junction of US Hwy 71 on St Rte 88, 2 ♂ I, 2 ♂ II, 2 ♀, 20 j ♂, 23 j ♀; roadside pool on Posey Hollow Road 4.5 mi N of Acorn and 1.4 mi E of US Hwy 71, 2 j ♂, 20 Apr 1973; flooded tributary to Irons Fork on Posey Hollow Road about 1 mi E of US Hwy 71, 1 j ♀, 20 Apr 1973; pool in roadside ditch 3.1 mi SE of St Rte 5 on St Rte 375, 2 ♂ II, 7 ♀, 24 j ♂, 23 j ♀, 20 Apr 1973.

*Variations.*—The variations noted are rather insignificant except for an occasional ratio such as that between areola length and carapace length; it is as low as 34.9 percent in one of the females, but the closest approached by another specimen was 36.0 percent, and the average is 37.5. The cephalomedian lobe of the epistome may or may not bear a marginal row of plumose setae. The antennae reach caudally to the second or third abdominal tergum. Pubescence on the third maxilliped is highly variable but seems to be longer and more conspicuous in the first form males; in some individuals of both sexes, the submarginal row may be short, obscuring little of the ventral surface of the ischium. The tubercular row on the mesial surface of the palm consists of five to eight, that on the opposable margin of the fixed finger seven to 11, that on the dactyl five to seven, that on the ventrodistal margin of the carpus two to six, that in the ventrolateral row on the merus 10 to 13, and in the ventromesial row 13 to 16. In the juvenile females the preannular plate is not evident, and the postannular sclerite is proportionately smaller than in the adult females.

*Relationships.*—*Procambarus* (G.) *reimeri* has its closest affinities with *P.* (G.) *gracilis* (Bundy, 1876:5) and *P.* (G.) *liberorum* Fitzpatrick (1978:533). It differs from the former most conspicuously in possessing a broader areola, in the shorter central projection (not overreaching the caudal process) of the first pleopod of the male, and in the absence of tubercles on the cephalolateral ridges of the annulus ventralis. It may be distinguished from *P.* (G.) *liberorum* also in having a broader areola, in the disposition of the caudal process (appearing acute in lateral aspect), and in lacking tubercles on the annulus ventralis. In all of the adult females of *P.* (G.) *reimeri*, the annulus ventralis is separated from the V-shaped sternum anterior to it by a firm though comparatively weakly calcified, ventrally convex structure that I interpret as being a homologue of the preannular plate characteristic of members of the subgenus *Austrocambarus*. To be sure, com-



paratively the plate in *P. (G.) reimeri* is not nearly so large as that in the crayfishes of Cuba, southern Mexico, Guatemala, and Honduras, but the similarities in position and texture are suggestive of a feature shared in common. If these may be assumed to be homologous structures, further credence can be given to previously postulated (Hobbs, 1967:11) close affinities between the members of *Austrocambarus* (derived from the Mexican-Cubensis ancestral stock) and those of *Girardiella* (Graciloid stock).

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